

WHAT IS CLAIMED IS:

1 1. A method for managing forwarding information in a router having a distributed
2 architecture including a plurality of routing nodes, the method comprising the steps of:

3 i) forming an aggregation tree corresponding to each routing node, the aggregation tree
4 including nodes corresponding to forwarding information of each routing node and virtual nodes for
5 aggregating forwarding information of each routing node;

6 ii) varying the aggregation tree when forwarding information is added to each routing node;

7 iii) checking a creation area of the forwarding information added to each routing node in step
8 ii);

9 iv) determining whether to advertise the forwarding information to other routing nodes by
10 analyzing the aggregation tree and making a determination to advertise the forwarding information
11 to the other routing nodes when the forwarding information was created in a local area of a
12 predetermined routing node;

13 v) advertising the forwarding information to the other routing nodes and storing the
14 forwarding information in a local forwarding table of the predetermined routing node when the
15 determination is made in step iv) to advertise the forwarding information to other routing nodes;

16 vi) determining whether to store the forwarding information in the local forwarding table of
17 the predetermined routing node by analyzing the aggregation tree and making a determination to
18 store the forwarding information in the forwarding table of the predetermined routing node when the
19 forwarding information was not created in a local area of the predetermined routing node; and

1 vii) storing forwarding information in the local forwarding table of the predetermined routing
2 node based on the determination in step vi).

1 2. The method as claimed in claim 1, wherein, in step i), a prefix, which is address
2 information for receiving forwarding information corresponding to each node of the aggregation tree,
3 length information about the prefix, a type of forwarding information, information of a source IOP
4 creating forwarding information, an IOP flag for notifying whether or not forwarding information
5 is advertised to other routing nodes, and an FT flag for notifying whether or not forwarding
6 information is stored in the local forwarding table are stored as a property of the node of the
7 aggregation tree.

1 3. The method as claimed in claim 2, wherein step i) includes the substeps of checking
2 a creation area of forwarding information, determining the type of forwarding information depending
3 on a sort of processors creating forwarding information when forwarding information is created from
4 the local area, and storing virtual type forwarding information as the type of forwarding information
5 if forwarding information is created from a virtual area.

1 4. The method as claimed in claim 3, wherein step i) includes the substeps of
2 determining that forwarding information is transferred from the virtual area if the prefix of the
3 forwarding information is a private IP (Internet protocol) address by analyzing the prefix, and
4 determining that forwarding information is created from the local area if the prefix of the forwarding

1 information is not the private IP address.

1 5. The method as claimed in claim 1, wherein step ii) includes the substeps of adding
2 a node corresponding to added forwarding information to the aggregation tree, and storing a property
3 of the node added to the aggregation tree based on a prefix and creation area information of added
4 forwarding information.

1 6. The method as claimed in claim 5, wherein, in step ii), the prefix, which is address
2 information for receiving forwarding information corresponding to each node of the aggregation tree,
3 length information about the prefix, a type of forwarding information, information of a source IOP
4 creating forwarding information, an IOP flag for notifying whether or not forwarding information
5 is advertised to other routing nodes, and an FT flag for notifying whether or not forwarding
6 information is stored in the local forwarding table are stored as the property of the node of the
7 aggregation tree.

1 7. The method as claimed in claim 6, wherein step ii) includes the substeps of checking
2 a creation area of forwarding information, determining the type of forwarding information depending
3 on a sort of processors creating forwarding information when forwarding information is created from
4 the local area, and storing virtual type forwarding information as the type of forwarding information
5 if forwarding information is created from a virtual area.

1 8. The method as claimed in claim 7, wherein step ii) includes the substeps of
2 determining that forwarding information is transferred from the virtual area if the prefix of the
3 forwarding information is a private IP (Internet protocol) address by analyzing the prefix, and
4 determining that forwarding information is created from the local area if the prefix of the forwarding
5 information is not the private IP address.

1 9. The method as claimed in claim 7, wherein step iii) includes the substeps of
2 extracting the type of forwarding information corresponding to the node added to the aggregation
3 tree in step ii) by analyzing the property of the node, and checking the creation area of forwarding
4 information corresponding to the node based on the type of forwarding information.

1 10. The method as claimed in claim 2, further comprising a step of varying a first flag
2 (IOP flag) and a second flag (FT flag) of the node according to a result achieved through performing
3 at least one of steps v) to vii).

1 11. The method as claimed in claim 1, wherein step iv) includes the substeps of:
2 a) checking whether or not a parent node of the node added to the aggregation tree in step ii)
3 exists in the aggregation tree; and
4 b) checking whether or not the node added to the aggregation tree in step ii) and the parent
5 node thereof are created from a same routing node if the parent node exists in the aggregation tree.

1 12. The method as claimed in claim 11, wherein, in step v), forwarding information
2 corresponding to the node added to the aggregation tree in step ii) is stored in the local forwarding
3 table of the corresponding routing node without advertising forwarding information corresponding
4 to the node added to the aggregation tree in step ii) to other routing nodes if the node and the parent
5 node thereof are created from the same routing node.

1 13. The method as claimed in claim 11, wherein, in step v), forwarding information
2 corresponding to the node added to the aggregation tree in step ii) is stored in the local forwarding
3 table of the corresponding routing node after advertising forwarding information corresponding to
4 the node added to the aggregation tree in step ii) to other routing nodes if the node and the parent
5 node thereof are created from different routing nodes.

1 14. The method as claimed in claim 11, wherein, in step v), if the aggregation tree has
2 no parent node of the node added to the aggregation tree in step ii), the parent node of the node is
3 created, and forwarding information corresponding to the node added to the aggregation tree in step
4 ii) is stored in the local forwarding table of the corresponding routing node after advertising
5 forwarding information to other routing nodes.

1 15. The method as claimed in claim 14, wherein, in step v), a node having a prefix, which
2 is determined by excepting a lowermost 1 bit value from the prefix of the node added to the
3 aggregation tree in step ii), is created as the parent node of the node added to the aggregation tree

1 in step ii).

1 16. The method as claimed in claim 1, wherein step vi) includes the substeps of:

2 a) checking whether or not a parent node of the node added to the aggregation tree in step ii)
3 exists in the aggregation tree; and

4 b) checking whether or not the node added to the aggregation tree in step ii) and the parent
5 node thereof are created from a same routing node if the parent node exists in the aggregation tree.

1 17. The method as claimed in claim 16, wherein, in step vii), forwarding information
2 corresponding to the node added to the aggregation tree in step ii) is stored in the local forwarding
3 table of the corresponding routing node if the node and the parent node thereof are created from
4 different routing nodes.

1 18. The method as claimed in claim 16, wherein, in step vii), if the aggregation tree has
2 no parent node of the node added to the aggregation tree in step ii), the parent node of the node is
3 created and stored in the local forwarding table of the corresponding routing node.

1 19. The method as claimed in claim 18, wherein, in step vii), a node having a prefix,
2 which is determined by excepting a lowermost 1 bit value from the prefix of the node added to the
3 aggregation tree in step ii), is created as the parent node of the node added to the aggregation tree
4 in step ii).

1 20. A method for managing forwarding information in a router having a distributed
2 architecture including a plurality of routing nodes, the method comprising the steps of:

3 i) forming an aggregation tree corresponding to each routing node, the aggregation tree
4 including nodes corresponding to forwarding information of each routing node and virtual nodes for
5 aggregating forwarding information of each routing node;

6 ii) analyzing the aggregation tree of each routing node in response to a deletion of forwarding
7 information in each routing node and checking a creation area of deleted forwarding information;

8 iii) advertising the deletion of forwarding information to other routing nodes only when the
9 forwarding information deleted is determined to have been advertised to other routing nodes after
10 analyzing the aggregation tree to establish that the forwarding information deleted was created in a
11 local area of the corresponding routing node, deleting the node corresponding to the forwarding
12 information deleted from the aggregation tree, and deleting forwarding information from a local
13 forwarding table of the corresponding routing node; and

14 iv) deleting the node corresponding to the forwarding information from the aggregation tree
15 when the forwarding information deleted was not created from the local area of the corresponding
16 routing node.

1 21. The method as claimed in claim 20, wherein, in step i), a prefix, which is address
2 information for receiving forwarding information corresponding to each node of the aggregation tree,
3 length information about the prefix, a type of forwarding information, information of a source IOP

4 creating forwarding information, an IOP flag for notifying whether or not forwarding information
5 is advertised to other routing nodes, and an FT flag for notifying whether or not forwarding
6 information is stored in the local forwarding table are stored as a property of the node of the
7 aggregation tree.

1 22. The method as claimed in claim 21, wherein step i) includes the substeps of checking
2 a creation area of forwarding information, determining the type of forwarding information depending
3 on a sort of processors creating forwarding information when forwarding information is created from
4 the local area, and storing virtual type forwarding information as the type of forwarding information
5 if forwarding information is created from a virtual area.

1 23. The method as claimed in claim 22, wherein step i) includes the substeps of
2 determining that forwarding information is transferred from the virtual area if the prefix of the
3 forwarding information is a private IP (Internet protocol) address by analyzing the prefix, and
4 determining that forwarding information is created from the local area if the prefix of the forwarding
5 information is not the private IP address.

1 24. The method as claimed in claim 22, wherein step ii) includes the substeps of
2 extracting the property of the node corresponding to deleted forwarding information from the
3 aggregation tree, extracting the type of deleted forwarding information based on the property of the
4 node, and checking the creation area of deleted forwarding information based on the type of deleted

1 forwarding information.

1 25. The method as claimed in claim 20, wherein, in step iii), deletion information of
2 forwarding information is not advertised to other routing nodes if deleted forwarding information
3 is not advertised to other routing nodes, and forwarding information is deleted from the local
4 forwarding table of the corresponding node after deleting the node corresponding to deleted
5 forwarding information from the aggregation tree.

1 26. The method as claimed in claim 20, wherein step iii) includes the substeps of:
2 a) checking whether or not a sibling node of the node corresponding to deleted forwarding
3 information exists in the aggregation tree by analyzing the aggregation tree; and
4 b) advertising information of the sibling node to other routing nodes if the sibling node of
5 the node corresponding to deleted forwarding information exists in the aggregation tree.

1 27. The method as claimed in claim 26, wherein step iii) further comprises a step of
2 deleting a parent node of the node corresponding to deleted forwarding information from the
3 aggregation tree when the aggregation tree has no sibling node of the node corresponding to deleted
4 forwarding information.

1 28. The method as claimed in claim 20, wherein step iv) includes the substeps of:
2 a) adding a sibling node of the node corresponding to deleted forwarding node to the

3 aggregation tree when information of the sibling node is transferred from a routing node creating
4 deleted forwarding information; and

5 b) storing sibling node information in the local forwarding table of the corresponding routing
6 node by analyzing the aggregation tree.

1 29. The method as claimed in claim 20, wherein substep b) includes the steps of:

2 c) checking whether or not a parent node of the sibling node added to the aggregation tree
3 in substep a) exists in the aggregation tree;

4 d) checking whether or not the sibling node added to the aggregation tree in substep a) and
5 the parent node thereof are created from a same routing node when the parent node exists in the
6 aggregation tree; and

7 e) storing forwarding information corresponding to the sibling node added to the aggregation
8 tree in substep a) in the local forwarding table of the corresponding routing node if the sibling node
9 added to the aggregation tree in substep a) and the parent node thereof are created from different
10 routing nodes.

1 30. The method as claimed in claim 20, wherein, in substep b), if the aggregation tree has
2 no parent node of the sibling node added to the aggregation tree in substep a), the parent node of the
3 sibling node is created and stored in the local forwarding table of the corresponding routing node.

1 31. The method as claimed in claim 30, wherein a node having a prefix, which is

determined by excepting a lowermost 1 bit value from the prefix of the node added to the aggregation tree in step a), is created as the parent node of the sibling node added to the aggregation tree in step a).

32. A method for managing the forwarding information, comprising the steps of:

forming in a router constructed with a distributed architecture including a plurality of routing nodes, an aggregation tree corresponding to each routing node, with the aggregation tree including actual nodes corresponding to forwarding information for each of the routing nodes and virtual nodes for aggregating forwarding information of each of the routing nodes;

varying the aggregation tree when forwarding information is added to each of the routing nodes;

identifying a creation area of forwarding information added to each of the routing nodes;

analyzing the aggregation tree, advertising to other routing nodes the forwarding information added, and storing forwarding information in a local forwarding table of a corresponding routing node when the forwarding information added is created from a local area of the corresponding routing node; and

storing forwarding information in the local forwarding table of the corresponding routing node based when the forwarding information added is not created from the local area of the corresponding routing node.

1 33. A method for managing the forwarding information, comprising the steps of:

2 forming in a router constructed with a distributed architecture including a plurality
3 of routing nodes, an aggregation tree corresponding to each routing node, with the aggregation tree
4 including actual nodes corresponding to forwarding information for each of the routing nodes and
5 virtual nodes for aggregating forwarding information of each of the routing nodes;

6 analyzing the aggregation tree of each of the routing nodes in response to a deletion
7 of forwarding information in each routing node;

8 determining a creation area of the forwarding information deleted from an aggregation
9 tree;

10 advertising to other routing nodes, the deletion of the forwarding information deleted
11 only when the forwarding information deleted had been advertised to other routing nodes by:

12 analyzing the aggregation tree for the routing node corresponding to the
13 forwarding information deleted when the forwarding information deleted had been created
14 from a local area of the corresponding routing node,

15 deleting one of an actual node and a virtual node corresponding to the
16 forwarding information deleted from the aggregation tree, and

17 deleting the forwarding information deleted from a local forwarding table of
18 the corresponding routing node; and

19 deleting one of an actual node and a virtual node corresponding to the forwarding
20 information deleted from the aggregation tree when the forwarding information deleted was not
21 created from the local area of the corresponding routing node.